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# PRODUCTION, TECHNOLOGY, AND LABOR ORGANIZATION AT THE "DINAMO" ELECTRICAL EQUIPMENT PLANT IMENI KIROV

N. Orlovskiy

In August 1948, personnel of the "Dinamo" Plant imeni Kirov promised to give the State an accumulation of 8 million rubles over and above the plan in 1948 by means of reducing production costs.

The "Dinamo" Plant, one of the oldest industrial enterprises in Moscow, observed its 50th anniversary recently. During the years of the prewar Five-Year Plans, it became one of the largest enterprises of the electrical industry. The plant is the principal maker of crane and haulage electrical equipment for Soviet heavy industry and transport.

Electrical machinery and equipment with the trademark "DK," ("Dinamo" imeni Kirov) is operating in Magnitogorsk, the Donbass, Zlatoust, Baku, at the Dnepr GES, in Vorkuta, Kemerovo, and Stalino; on the locks of large hydraulic installations; at thousands of factories, plants, mines, harbors, stations; on ship ; in the Urals and the Caucasus, on the local trains of Moscow and Leningrad, on the subways of the capital, and every place where railroad transport is electrified and there are trolley cars and streetcars.

In 1948, the "Dinamo" Plant became the organization base for the construction of a group of new plants called for by the Postwar Five-Year Plan. The plant assigned specialists, designers, technologists, and highly skilled workers to serve as the nucleus of the new detachment of electrical machine-building workers.

Gradually, all the industrial equipment is being delivered to the new enterprises.

The "Dinamo" Plant, which specializes in production of crane and haulage electrical equipment, is to manufacture new, heavier types of equipment for outfitting these new plants.

The plant began its drive for exceeding of planned accumulation under difficult circumstances. The plant produces a varied assortment of 1,500 - 2,000 items distinct in type and specifications, and requires tens of

thousands of types of materials. Small-series production predominated at the plant. The technological processes were extremely varied, and approximately 100,000 production norms were in force.

For rationalization of the industrial process and enlargement of lots of production, it was necessary to minimize the number of types of products and to standardize the technology. The first objective of this work was electric motors for municipal transportation. The plant had manufactured a separate series of machines requiring a particular industrial technology for each type of electrified transportation (streetcar, trolley car, subway and bus).

The plant designers devised a unified series of electric motors for all types of municipal transportation. Each motor now goes through the same technological processes. The engines for each type of transportation differ only in size. These designs were introduced in 1948 and sharply changed production conditions. The similarity of the technological operations made it possible to produce all the engines with the same machine-tool equipment and to use common presses. It became possible to make uniform cutting and measuring tools differing only in size. This facilitated tool manufacture. The production series was enlarged and production increased. All this created conditions for introduction of mass production on a conveyor-belt system.

The designers also simplified manufacture of the engines. Until then the electric motors for municipal transportation had been attached to the axle of the car. Such a suspension involved great shock to the electric motor, which required special protection from the impact. This complicated the design of the electric motor, and along with the limited gear ratio of the transmission which made the engine relatively low-speed, it increased the size and weight of the electric motor. The designers put the suspension on the frame of the body or on the truck with cardan joints. This sharply reduced the shock to the motor and increased its speed.

In increasing the simplicity of the designs, the plant's designers and technologists replaced the former octahedral cast-steel framework (ostov) with a round framework. This greatly simplified the casting and also made it possible to make the motor framework out of pipe, which was supplied by the metallurgical industry. This helped eliminate the bottlenecks in steel casting and machining.

Thus, new light, high-speed electric motors were created which required much less labor and material to build. While maintaining the previous power, the weight of the new streetcar motor is almost cut in half (from 960 to 500 kilograms), and labor input has decreased 27 percent (from 550 to 400 hours). This makes possible a saving of hundreds of tons of metal and hundreds of thousands of man-hours.

The new subway car motor has had a great economic effect. With a slight reduction in motor power, its weight was decreased 57 percent (from 1,450 to 625 kilograms), and labor input 44 percent.

Labor input for trolley-car electric motors and diesel-electric bus motors was decreased approximately 15 percent. The weight of a bus motor was reduced 10 percent and the power of a trolley car motor was increased 12 percent with retention of its weight. The creators of the series of new engines are Engineers Tikhomenev, Ioffe, Patalov, and Vasil'yev; the chief designer of the plant is Rabinovich.

A new standard series of electric crane motors, MT, has been designed and developed to replace the old KT series. New designs for a series of safety devices for electric mine locomotives have been worked out, a new series of electromagnetic brakes has been introduced, and a new type of high-power magnetic hoisting device for the metallurgical industry developed and put into series production for the first time in the USSR.

Much has been done to improve the technology and organization of foundry work, one of the important elements in the "Dinamo" Plant. A new steel-casting technology has been introduced which was developed by Engineer Levi. Use of concealed (zakrytykh) deadheads under atmospheric pressure made possible great saving in steel, electric power, oxygen, and acetylene. Labor consumption in the operation of autogenous cutting of deadheads decreased 60 - 70 percent. The introduction of the new steel-casting technology saves 2 million rubles a year.

The development and introduction of casting poles (polyus) of electric traction motors with the use of chill forms instead of deadheads also had a big effect. The partial introduction of this innovation is saving the plant 200 tons of steel a year, reducing labor consumption in refining and autogenous work 80 - 90 percent, and increasing the productivity of labor of molders 20 percent. Allowances in machining have decreased 10 - 15 percent. This work was carried out by Engineers Levi, Krasnov, Kurin, and Anisimov.

The metallurgists of the plant did other work which had a great economic effect. The chief metallurgist worked out and introduced new formulas for mold and core mixtures without grease binders or starch gum. The formulas save 12 tons of grease binders and 6 tons of starch gum a year. A technology of casting casings for electric motors with repellent (otbivnyy) deadheads has been developed and introduced. In this casting the labor in autogenous cutting is reduced 85 percent.

A study was made of the process of smelting pig iron in cupola furnaces with the blast enriched with oxygen. A unique plan of feeding oxygen into a cupola furnace was carried out in the foundry. This plan made it possible to use liquid oxygen directly from cold gasifiers. The study showed that with this technology the productivity of a cupola furnace was three to four times greater, fuel consumption was reduced 30 - 50 percent, and the flowability of pig iron in smelting in an oxygen blast increased 20 - 80 percent, thus greatly reducing casting scrap. Decreased sulfur loam makes it possible to carry on smelting with low-grade, more sulfurous types of fuel.

The central plant laboratory is very much occupied with the problem of decreasing expenditures for raw materials and expensive insulating. It developed a technology of manufacturing electric motor coils without outer insulation. The introduction of this technology in the production of electric motors for Diesel-electric buses alone saves 3 tons of mica sheet (mikalenta) a year costing 200,000 rubles. An important saving of scarce mica insulation is made by replacing it with a synthetic triacetate coating. Use of this substitute on rotor busbars of electric crane motors and on units (sektsiya) of streetcar motors saves approximately 3 tons of mica insulation a year and reduces production cost 150,000 - 200,000 rubles.

The plant is also working on replacing the lacquering of iron for electric engines and other equipment with a new technological process, oxidation, which will make it possible to eliminate the bottleneck in punch-press production and at the lacquer machine, improve the quality of iron, and decrease waste. This innovation will save the plant 500,000 rubles a year.

In electric engine production, [illegible] (shikhtovka) have been put into operation for the first time. This mechanizes the heavy work of charges (shikhtovshchik). [illegible] which permit each worker to wind stators independently have been introduced in the winding division of the electric-crane-motor shop. The winding formerly required two men. This saves 23,000 work hours per year. In the press station one-groove (odnopasovyye) stamps are being replaced by two- and three-groove and compound stamps, and one-groove press forms by multiple-groove forms. This reduces labor-consumption approximately 15,000 work hours a year.

Engineers Gorshkov, Fedorov, and Pimenova have proposed a new method for insulating electric engine coils. Realization of this proposal will save 385,500 rubles per year. Replacing micanite collector cups (manzheta) of electric motors with paper-micanite collector cups will save 225,000 rubles and reduce labor-consumption 9,000 work hours.

Molder Mos'kin suggested production of bronze bushing mold frames on two screens simultaneously. This greatly increased the productivity of labor.

Through the suggestion of Foreman Kolesnikov, the stator coils of alternating-current crane motors were converted from arc welding to contact spot welding. This saves 2.5 tons of steel and raises the quality of the stator coils. The conversion of a number of products of nonferrous metal from torch welding to spot welding will make the productivity of labor three times greater and will save silver, carbide and oxygen.

The plant saved 2,300,000 rubles during 1948 through innovations in production.

Both intraplant and, particularly, shop cost accounting are playing a tremendous role in the drive for increased profitableness. Until 1948, the plant had not succeeded in introducing shop cost accounting.

In April 1948, the plant began to put the shops gradually on a cost accounting basis. The casting room and punch-press shop, which require the largest amounts of metal, were the first to be converted. The welding, forging, reinforcing, winding, and insulating shops were next. Then the conversion of subsidiary shops was started, and finally that of the manufacturing (vypuskayemyye) shops. The conversion of all the shops to cost accounting was completed by the 31st anniversary of the Great October Socialist Revolution.

The shop cost accounting is based on the conventional system of planning and accounting. The plant rejected the practice of special "cost accounting" recording, a complicated system of calculation, and the introduction of specific material responsibility for the results of the shops' activity. Shop cost accounting is based on the following principles: A production plan of quantitative and qualitative indexes is established for a shop. Material and labor resources for fulfillment of the production program are allotted to the shop in accordance with its requirements, which are determined by the consumption norms. All the principle technical and economic indexes are taken into consideration in estimating plan fulfillment. Control is established over utilization of resources -- labor, materials, semifinished products, power, and tools. A system of material incentive is used for encouraging production and cost reduction.

Production cost has attained decisive importance in the evaluation of a shop's work, and great changes have taken place in the attitude of the workers. Every foreman, shop director, and all the workers more strictly observe the planned cost of products and quality of production.

In 1948, the casting shop had a casting cost reduction of 18 percent over 1947, saving 4,100,000 rubles, 1,500,000 rubles of which were over and above the plan. The punch-press shop had a metal saving of approximately 4 percent.

The installation in the casting shop of a fourth roller-conveyer line in the mechanized section for medium steel castings will increase the section's labor productivity 25 percent. The planned installation of a second roller conveyer line in the small steel castings section will have a still greater effect.

In August 1948, the founders converted casting of electric motor bearing housings for municipal transportation from steel to a modified pig iron. As a result of this technical innovation, the consumption of molten metal in casting was cut in half, and the production cycle was shortened two to three times. Autogenous cutting of deadheads was eliminated in this process. The conversion of 15 steel-casting matrices from dry to wet molding made the molding production cycle three times shorter. The conversion of 90 matrices from manual to machine molding increased labor productivity 25 percent.

In the casting shop the molders engaged in socialist competition for increasing the output of "Krechmer" machine tools from 80 to 117 [sic]. The molding brigade suggested belt conveyence of the loam to the work place in special bins instead of cases. Through improvement in technology, the brigade saves one cubic meter of fettling loam per day. Merkin's brigade of molders operating VF-20 machine tools increased flask-casting from 60 to 90 - 100 per shift. This was attained particularly by freeing the brigade from secondary work.

For the fourth quarter of 1948 alone, the punchers had an accumulation of 100,000 rubles over and above the plan. In this shop attention is concentrated on rational utilization of materials.

In the supply section hundreds of kilograms of scrap, narrow and irregularly shaped bars, which formerly became waste and went for furnace charge, are now utilized. Scrap of millimeter steel is used for producing small stampings such as terminal poles and washers. Gaskets and washers are stamped out of 3-millimeter steel scrap.

The punch-press shop formerly received plate of only one size, but now it is supplied with plate of other sizes in accordance with its requirements.

The majority of the shops are fulfilling and exceeding the cost-reduction plan. In 1948, only the first equipment shop did not fulfill this cost plan. This was due to the fact that the shop's management did not know how to organize the work on a cost-accounting basis and did not stress proper use of materials and semifinished products. As a result the shop exceeded the planned cost of production. Although the personnel exceeded the production plan, they were deprived of a bonus. This persuaded them to introduce cost accounting.

The plant is steadily fulfilling the more progressive norms of utilization of metallurgical equipment and of pig-iron casting output from one square meter of casting area and the output per ton of capacity of a cupola furnace. Nevertheless, the machine-tool park is still far from fully utilized in all the shops and sections of the plant. On the average, it is operated by one and a half to two shifts, causing an intrashift loss of 7.8 percent.

The plant has activated a drive against defective materials and other losses in production. Losses from defective material in 1947 amounted to 1.33 percent, which, although a seemingly small percent, represented a loss of hundreds of thousands of rubles. This defective material originates principally in the casting shop. The defective material occurs as follows:

bending, 23 percent of all casting flaws; presence of undesirable elements, 14 percent; blisters, 17 percent; and cracks, 7 percent. The winding-insulating and armature shops are responsible for much defective material. Damage to machinery in transporting and assembling is not unusual.

The foreman of the casting shop has carried out a number of measures to decrease flaws in the casting of bushings and discs (shayb) for electric mining motors. As a result, losses from defective material were decreased 30,000 rubles.

Flaws amounted to 12 - 13 percent in manufacture of equipment (apparatnyy) coils from PEL wire until 1948. In 1948, an analysis of the performance of these coils was made, and the technology of their manufacture was changed. As a result, flaws were decreased sharply, 130,000 rubles were saved, and labor-consumption was reduced by 6,500 work hours.

Electric meters (electric measures of current ratio of original design) were developed by the electrical gauging laboratory. These meters make it possible to control better the course of the technological process and accelerate testing of the finished product.

There is still much to be done in elimination of defective material, but certain results have been attained: losses from flaws have been decreased from 1.33 percent to 1.25.

Additional expense is caused by irregular rate of production. The principle reason for this is the lagging of the supply shops, which retards increase in the plant's output.

In 1948, the supply shops were reorganized; some were given more space, their specialization was inspected, and additional equipment and workers were provided. All this made it possible to increase greatly the output of the supply shops. However, this output is still insufficient, since it does not meet the monthly requirements of the mechanized assembly shops.

Irregular work still has not been eliminated in the operation of the plant. It is caused by stoppages or incufficiently intensive work of the mechanical and assembly sections in the first half of the month and overwork in the second half.

In 1947, losses of work time amounted to 17.3 percent in the supply section of the first equipment shop. Stoppages in waiting for delivery of materials constituted 13.4 percent of this. Time cards of the work day in 1948 showed that losses of work time in this section were only 2.3 percent.

Decrease in loss of work time is characteristic of the entire plant, but the losses are still far from eliminated.

"Dinamo" Stakhanovites have introduced advanced work methods. Machine-tool worker Khrykin riveted bolts and screws from wire of three gauges, with a bore of 6, 8, and 10 millimeters. He introduced new dies and, as a result, bolts from wire of 4- and 5-millimeter gauge are manufactured on this machinery. The maximum length of bolts manufactured on the machinery had been 60 millimeters. Khrykin proposed remodeling the dog which made possible the making of bolts and screws with a length of 85 millimeters.

The "Dinamo" Plant makes extensive use of material incentives. The proportion of bonuses in the wages of engineering and technical workers in 1948 was approximately 3.5 percent. In the wages of workers paid by the periodical premium system, the proportion of bonuses was 23 - 24 percent. The proportion of bonuses in the wages increased even more significantly in the individual shops which methodically increased their production rate and improved their qualitative indexes.

Technical study has been very influential in raising the level of productivity of labor; 1,692 men at the plant have been trained through various types of schools and courses. Approximately 45 percent of the workers have taken courses. Many workers are trained in the plant school for young workers.

In 1948, the "Dinamo" Plant greatly exceeded the prewar and 1947 production levels. The increased volume of production was 70 percent due to increased productivity of labor, and 30 percent due to the increased number of workers. The state plan was fulfilled 125.6 percent in 11 months and the assigned number of types 100 percent.

The annual plan was fulfilled 29 October 1948. A month later, 29 November, the "Dinamo" collective reported fulfillment of the Five-Year Plan with respect to level of production in less than 3 years: in 10 months and 29 days the plant had achieved the volume of output specified by the Plan for all of 1950. It was more than one and a half times greater than the prewar production level.

According to plan, labor productivity had to be increased 13 percent; actually it was increased 33 percent.

Shop and plant expenditures were reduced through simplification of operations equipment. Consumption of raw materials was 9.9 percent less than in 1947, which reduced cost 5.1 percent. However, saving in material consumption still has not reached the proportions specified by the plan.

As a result of organization and technical measures and rationalization, there was a decrease in consumption of work time and a corresponding relative wage and cost decrease of approximately 31 percent. Through this reduction, production cost was decreased 3.8 percent over 1947, which was a greater reduction than called for,

When the waste decrease and certain commercial expenditure decreases were added to these reductions, the total cost of production in 1948 was 19.7 percent lower than 1947. The plan had specified a cost reduction of only 10.5 percent.

The 1948 plan specified a plant accumulation of 8,300,000 rubles. The "Dinamo" Plant promised to exceed the accumulation plan by 8 million rubles, or to release to the state 16,300,000 rubles in all. It exceeded its promised quota and released 27 million rubles.

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